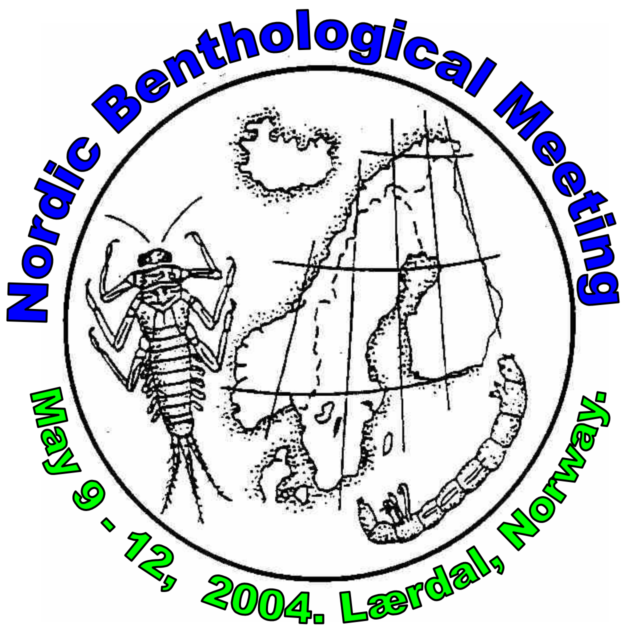
REPORT SNO 4827-2004

Fifth Nordic Benthological meeting

May 9-12, 2004
Lærdal, Norway



Norwegian Institute for Water Research
– an institute in the Environmental Research Alliance of Norway

REPORT

Main Office	Regional Office, Sørlandet	Regional Office, Østlandet	Regional Office, Vestlandet	Akvaplan-NIVA A/S
P.O. Box 173, Kjelsås	Televeien 3	Sandvikaveien 41	Nordnesboder 5	
N-0411 Oslo, Norway	N-4879 Grimstad, Norway	N-2312 Ottestad, Norway	N-5008 Bergen, Norway	N-9005 Tromsø, Norway
Phone (47) 22 18 51 00	Phone (47) 37 29 50 55	Phone (47) 62 57 64 00	Phone (47) 55 30 22 50	Phone (47) 77 68 52 80
Telefax (47) 22 18 52 00	Telefax (47) 37 04 45 13	Telefax (47) 62 57 66 53	Telefax (47) 55 30 22 51	Telefax (47) 77 68 05 09
Internet: www.niva.no				

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Abstract

The Fifth Nordic Benthological Meeting was held in Lærdal at the Norwegian Wild Salmon Centre from May 9-12, 2004 , and for the first time in Norway. This report gives the program for the meeting, the list of participants and abstracts for the invited and contributed papers together with abstracts for the posters presented.

4 keywords, Norwegian	4 keywords, English
1. Nordic Benthological Society , NORBS	1. Nordic Benthological Society , NORBS
2. NORBS konferanse 2004, Lærdal	2. NORBS meeting 2004, Lærdal, Norway
3. Program	3. Programme
4. Sammendrag av foredrag og plakater	4. Abstracts of oral presentations and posters

Project manager	Research manager	Head of research department
Karl Jan Aanes	Stig A. Borgvang	Nils Roar Sælthun

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FIFTH NORDIC BENTHOLOGICAL MEETING

Programme and Abstracts

Lærdal Kommune

Edited by
Karl Jan Aanes

Printed by
Norwegian Institute for Water Research
Oslo, Norway.

ISBN 82-577- 4507- 3

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Organisers

Host of the Meeting

Norwegian Institute for Water Research, NIVA

Local Organising Committee

Karl Jan Aanes, Norwegian Institute for Water Research, Oslo. John E. Brittain, University of Oslo. Gunnar Raddum University of Bergen. Jo Vegar Arnekleiv University of Trondheim and Torleif Bækken Norwegian Institute for Water Research, Oslo.

Practical Arrangements

The Norwegian Wild Salmon Centre, The municipality of Lærdal and Østfold Energi Produksjon AS

Sponsors

Norwegian Institute for Water Research, The municipality of Lærdal and Østfold Energi Produksjon AS

General Information

Meeting Site

The Nordic Benthological Meeting 2004 is held in the Sogn og Fjordane county at Lærdal a small municipality with 22.00 inhabitants. The meeting venue is The Norwegian Wild Salmon Centre located in the small village Lærdalsøyri.

Meeting Office

The Meeting Office is located in the lobby of the Norwegian Wild Salmon Centre. The Office will be open for registration and information on Sunday, May 9th 18.00-20.30, on Monday and Tuesday May 10th - 11th from 08.30 to 09.00, and during breaks for coffee and lunch. The telephone number during the Meeting is +47 950 72 601 and the telefax number +47 57666682

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Registration

Registration takes place on the Meeting Office. There will be a guided tour around in The Norwegian Wild Salmon Centre on Sunday at 19.00.

Material

All Meeting Material, the programme, abstracts, tickets to the social activities according to advance reservations will be given to the participants upon registration.

Badges

All registered participants receive a badge upon registration. The badge is your ticket to enter the Meeting and the social activities. Please have your badge visible during all events. The colour codes of the badges are:

- White for participants
- Blue for organisers, assistants and staff members.

Copying

Copying services are available at the Meeting Office at a reasonable price.

Meals and Coffee Breaks

There will be a free reception at 20.30 in the restaurant “Laksen” at The Norwegian Salmon Centre with beverages and a buffet composed of different food from the region. Lunch on Monday and Tuesday is included in the conference fee and will be served in the restaurant “Laksen”. Coffee and tea, also included in the registration fee, will be served in connection with breaks. The official NORBS dinner will be served in The Norwegian Salmon Centre at 19.00 on Monday.

Messages and Changes in the Programme

Messages to participants will be posted on the bulletin board. Any changes in the programme will also be announced on the bulletin board and in connection with the opening remarks every morning.

Accommodation

The main hotels (Lindstrøm hotell and Lærdal Ferie- og Fritidspark) are located in walking distance from the meeting site. The rooms are to be paid directly to the hotels. No special transportation has been arranged between the hotels and the meeting site.

Transportation

There is no special transportation since the hotels and-, the reception site are all located within walking distance from the Meeting Site.

SCIENTIFIC PROGRAM

Opening

The official opening of the Meeting will be held at 09.00 on Monday, May 10th, in the Auditorium of the The Norwegian Salmon Centre. The opening lecture is the Presidential Address given by *Richard K. Johnson*, Sweden.

Invited Lectures

The invited lectures will be given by *John Brittain*, Norway, *Gaute Velle*, Norway, *Gunnar Raddum,* Norway, *Timo Muoka,* Finland and *Jo Vegar Arnekleiv,* Norway. The lectures will take place in the auditorium of the The Norwegian Salmon Centre.

Contributed Paper Sessions

The papers will be presented in 4 contributed sessions on Monday and Tuesday in the auditorium.

Slide Room and AV-equipment

We hope to have a slide room available for all speakers for preparing their presentation. For any additional equipment please contact the Conference Office. However, if special equipment has not been ordered in advance the organisers can unfortunately not guarantee to provide equipment.

Poster Exhibition

The posters will be exhibited in the lobby on the ground floor. The numbers on the poster board refer to numbers in the programme book. The posters may be set up during Sunday evening and on Monday. Before the poster session on Monday there will be a possibility for all who have a poster to give a short presentation (3 min) in plenum.

Chironomidae Workshop

A one-day pre-conference workshop on **Chironomidae taxonomy** and **ecology** was planned on Sunday the 9th, but due to lack of interest we have decided to cancel this event. Instead, Prof. Ole A. Sæther and others from his group in Bergen have given those interested a unique possibility to discuss taxonomical problems during the meeting. They will bring equipment (microscopes etc.) with them and a separate room will be available. Please take advantage of this opportunity by bringing along specimens you would like them to identify or problems connected to this group you would like to discuss.

SOCIAL PROGRAM AND TOURS

The Opening Reception

Sunday May 9th 18.00-22.00
The office for **registration** opens at 1800 at The Norwegian Wild Salmon Centre on Sunday and at 1900 there will be a guided tour in the centre. At 20.30 there will be a **reception** in the restaurant "Laksen" with beverages and a buffet composed of different food from the region.

Excursion along the Lærdal River

Tuesday May 11th 18.00-22.00
There will be a field trip along the Lærdal River with departure from The Norwegian Wild Salmon Centre at 18.00. We will by a bus be taken to some interesting localities along the river and guided by local authorities. Equipment for sampling will be available. Historical background will be given connected to fact that the River Lærdalselven was earlier one of the world's most famous salmon rivers for angling. Focus will also be given to the situation before and after the hydro power development and the *Gyrodactylus salaries* problem. Before we return to the hotels we will have a guided tour in Stuvane Hydro Power Station followed by refreshments.

Post-Conference Tour

Wednesday May 12th
The Post-Conference Tour will make you acquainted with the water courses in this part of Norway. If you still consider participation in the Post-Conference Tour we would like to point out that reservations must be made by Monday noon to the Conference Office. The tour starts from Hotel Lindstrøm on Wednesday at 09.30.

More information are given in the appendix of the report

Lærdal to Bergen
Co ordinator: Gunnar Raddum (gunnar.raddum@zoo.uib.no).

Lærdal to Oslo
Co ordinator: John Brittain (jbr@nve.no).

DAILY PROGRAMME

Sunday, May, 9, 2004

18.00 – 20.30	**Registration.**	Conference Office open for Registration
19.00 – 20.00	**Guided tour**	The Norwegian Wild Salmon Centre
20.30 – 22.00	**Reception**	The Norwegian Wild Salmon Centre

Monday, May, 10, 2004

08.30 - 09.00	**Conference Office open for Registration**
09.00	**Opening remarks** Karl Jan Aanes, Chairman of the meeting
–	**Welcoming address** Knut A. Aarethun, Mayor of Lærdal Municipality
09.40	**Presidental address** Richard K. Johnson, President NORBS
09.40 – 10.25	**Keynote Address** Chair: Gisli Mar Gislison (Iceland) *Freshwater insects in a changing world – future trends in Nordic benthic diversity.* **John Brittain (Norway)**
10.25 - 11.10	**Keynote Address** *Recolonization of Scandinavian freshwaters after the Pleistocene glaciations.* **Gaute Velle (Norway)**
11.15 - 1130	Coffee Break in the lobby outside the auditorium.
11.30 -	**Contributed Papers Session I** Chair: John Brittain (Norway) *Improvement in ecological quality of Danish streams: Macroinvertebrate indicator taxa becoming more abundant and widespread.* **Jens Skriver (Denmark)**
11.50	*Streams in the Midland Forest at Öland; how to value conservation qualities.* **Jan Herrmann, Isabell Petersson, Bengt Johan Geijer (Sweden)**
12.10	*The Impact of Urban Patterns on Ecosystem Dynamics.* **Christina Maria Avolio (USA)**
12.30	*The effect of deforestation on benthic invertebrates in rivers in Iceland.* **Gisli Mar Gislason (Iceland)**
13.00 - 14.30	**Lunch** " Laksen " at The Norwegian Wild Salmon Centre

Monday, May, 10, 2004

14.30 - 1510	**Keynote Address** Chair Timo Muotka (Finland) *The role of the reference in detecting ecological change: error and expectation* **Richard K. Johnson (Sweden)**
15.10	Contributed Papers Session **II** *Does bug diversity have an effect on our streams?* **Björn Malmqvist (Sweden)**
15.30	*Do littoral macroinvertebrates correspond to "proper" limnological lake types?* **Henn Timm & Toomas Kõiv (Estonia)**
15.50	*Species-specificity among lake-dwelling shredders* **Ulf Bjelke (Sweden)**
16.15 - 16.30	Coffee Break in the lobby outside the auditorium.
16.30 -	Poster presentation in plenum - 3 min. available for each poster. Chair: Gunnar Raddum (Norway)
17.00 – 18.00	Poster Session

1. *Seven years of invertebrate colonisation in a manmade wetland system.*
   Petersson Isabell and Jan Herrmann (Sweden)

2. *Decomposition of macrophyte litter under different experimental conditions.*
   Bohman, Irene M. (Sweden)

3. *Trophic fractionation in Chironomus riparius reared on food of aquatic and terrestrial origin.*
   Goedkoop, Willem, Nina Åkerbloml and Marnie H. Demandt. (Sweden)

4. *Temporal and spatial changes in the macrozoobenthos communities of littoral zone in Lake Peipsi.*
   Kumari, Margit and Kangur, Külli. (Estonia)

5. *Distribution and filtration rate of the zebra mussel Dreissena polymorpha (Pallas) in Lake Peipsi.*
   Mälton, Evely & Kangur, Külli. (Estonia)

6. *Making Wild Rivers Wilder. Ecological Recovery of the Vindel and Pite Rivers (EVP), Sweden.*
   Hjerdt, N., J. Helfield1, E. Törnlund1, R. Jansson, C. Nilsson, F. Lepori, B. Malmqvist, D. Palm, J. Östergren, H. Lundqvist, E. Brännäs. (Sweden).

7. *Impact of river regulation on blackfly populations and surrounding terrestrial ecosystems.*
   Strasevicius, Darius and Björn Malmqvist. (Sweden).

8 *Biological quality in Estonian running waters:*
Rapid bioassessment of reference streams using macroinvertebrates.
Mardi1, Kristiina, Nikolai Friberg and Henn Timm. (Estonia)

9 *Changes in benthic invertebrate assemblages and incidence of larval deformities in response to industrial pollution in River Kymijoki, Finland.*
Kiiski1, Anna., Heikki Hämäläinen , Simo Salo , Matti Verta , and Jussi V.K. Kukkonen (Finland).

19.00 - 22.00 **NORBS – Official Dinner** at The Norwegian Wild Salmon Centre.

Tuesday, May, 11, 2004

09.00 - Opening remarks
Karl Jan Aanes

Keynote Address
Chair: Richard K. Johnson (Sweden)

09.15 - *Impact of hydropower development in Norway on aquatic invertebrates.*
Gunnar Raddum (Norway)

10.00 - *Recovery of benthic communities and ecosystem processes in restored streams.*
Timo Muoka (Finland)

10.45 - 11.00 Coffee Break in the lobby outside the auditorium.

Keynote Address
Chair: Jens Skriver (Denmark)

11.00 - *Introduction of new species and the effect of measures such as rotenone treatment on the benthos.*
Jo Vegar Arnekleiv (Norway)

Contributed Papers Session III

11.45 - *Recolonization of invertebrates after rotenone treatment of a West Norwegian river.*
John A. Gladsø and Gunnar G. Raddum (Norway)

12.05 - *Short-time effects of rotenone on benthic invertebrates in two Norwegian rivers.*
Gaute Kjærstad and Jo Vegar Arnekleiv (Norway)

12.25 - *Leaf litter breakdown at stream sites with different pH and organic carbon regimes.*
Zlatko Petrin et al. (Sweden).

12.45 - 14.15 **Lunch** “ Laksen “ at The Norwegian Wild Salmon Centre

Tuesday, May, 11, 2004

	Contributed Papers Session **IV**
	Chair: Bjørn Malmquist (Sweden)
14.15 -	*Standardisation of river classifications (STAR) - a EU-project supporting the Water Framework Directive.* **Jens Skriver et al. (Denmark)**
14.45 -	*An assessment of chironomids as a tool for inferring Holocene climate.* **Gaute Velle (Norway)**
15. 15 -	*Placing a hundred thousand species including 1202 chironomids on the internet.* **Ole A. Sæther (Norway)**
15.45 - 16.00	Coffee Break in the lobby outside the auditorium.
16.00 - 17.00	Society affairs Closing the meeting Invitation to the Sixth Benthological Meeting **Karl Jan Aanes (Norway) and Richard K. Johnson (Sweden)**
18.00 - 22.00	Field trip - Lærdal River

Wednesday, May, 12, 2004

09.30	**Departure Post Conference Tours**

INVITED LECTURES

Freshwater insects in a changing world - future trends in Nordic benthic diversity.

Brittain, John E.

Freshwater Ecology & Inland Fisheries Laboratory (LFI), Natural History Museums and Botanical Garden, University of Oslo, P.O. Box 1172 Blindern, 0318 Oslo, Norway.

E-mail: **jbr@nve.no**

Aquatic insects were present as far back as the Permian. Thus, they have survived several major environmental shifts. Despite the problems associated with selection processes operating in both terrestrial and aquatic environments, aquatic insects have successfully colonised a wide range of freshwater habitats from the tropics to the arctic. However, the range of environments differs among the hemimetabolous aquatic insects, with Ephemeroptera displaying a wider range than other orders such as the Plecoptera and Odonata. Many species of Ephemeroptera display considerable flexibility in life cycle length and timing in relation to environmental changes. This is particularly apparent in arctic and alpine species. Climate change scenarios predict rapid shifts in environmental conditions, not only temperatures, but in the frequency and magnitude of floods and droughts. Changes in the aquatic insect fauna are hypothesised in the light of the environmental tolerances, life cycle plasticity and the dispersal mechanisms of present day taxa. Nevertheless, despite the potential ramifications of climate change, impacts such as pollution, urbanization and land-use changes are rapidly reducing both habitat availability and quality, and as such pose a greater potential threat to aquatic insect diversity.

Recolonization of Scandinavian freshwaters after the Pleistocene glaciations.

Velle, Gaute

Department of Biology, University of Bergen, Musèplass 3, N-5007 Bergen, Norway.

E-mail: Gaute.Velle@zoo.uib.no

This talk presents a review of the recolonization of Scandinavian freshwaters after the last Ice Age. The recolonization occurred seemingly with little delay after the deglaciation. There are two main theories for the recolonization origin, either from distant refugia, or from local nunataks. The nunatak theory in biogeography states that certain Scandinavian alpine plants and animals survived the last glacial stage on ice-free areas within the glaciated land mass.These areas may have been coastal or alpine. Post-glacial expansion and recolonization occurred from these areas.Resent studies suggest there may have been extensive ice-free areas on the Scandinavian mainland during full glacial conditions in the Weichsel, however, the presence of nunataks does not prove that aquatic biota were present. The environmental conditions on these nunataks were most likely extremely harsh, especially in alpine areas. Hence, nunataks are most likely of limited importance for mass recolonization of Scandinavian freshwaters. Opposing the nunatak theory, the *tabula rasa* theory states thatno plants or animals could survive the entire Pleistocene on unglaciated areas in Scandinavia. Life was completely eradicated and all animals and plants survived outside the ice sheet margin in glacial refuges.Hence, the recolonization into Scandinavia occurred from glacial refuges. There were two main glacial refuges, including a southern peninsular area (Italy, Iberia, and Balkan) and an eastern/ Siberian area. The recolonization from these refuges occurred via continuous freshwater channels in two main steps. First, into the large ice margin lake of Ancylus in the Baltic, and secondly, into the Scandinavian mainland. In addition, birds from Denmark, Britain, Doggerland (presently the North Sea), and from the Ancylus area most likely aided in the northwards dispersal of a number of freshwater organisms, and especially crustaceans. The recolonization origin of flying insects in Scandinavia may hypothetically have varied north and south of the Polar front. In later years, humans have introduced a number of species into Scandinavia.

The role of the reference in detecting ecological change: Error and expectation.

Johnson, Richard K.

Department of Environmental Assessment
Swedish University of Agricultural Sciences,
P.O. Box 7050, S-75007, Uppsala, Sweden.

E-mail: richard.johnson@ma.slu.se

Ecological assessment of aquatic ecosystems is a growing area of research, and in Europe in particular this area is experiencing rapid expansion since the ratification of the European Water Framework Directive (European Commission, 2000). One caveat in implementing the WFD is the need to establish a benchmark, reference condition to be used in establishing the upper anchor for setting class boundaries and for identifying departures from expected that may be caused by anthropogenic stress. A number of methods are presently used to establish reference conditions for aquatic ecosystems, but, unfortunately, little is known of the inherent uncertainty associated with the different methods. Here I will focus on some of the errors associated with different methods used to establish reference conditions and, in particular, the pivotal role that reference condition has on the uncertainty of classification. Another challenging aspect of the WFD is the innovative approach of using different taxonomic groups to detect ecological change. The reasoning behind the use of different groups of organisms is that they respond differently to human-generated pressures and that using complementary taxonomic groups or metrics should result in more robust measures of ecological change while minimizing levels of uncertainty (e.g. false positive and false negative errors). Although conceptual models exist of a number of stressor-response relationships, more knowledge is needed regarding the selection of complementary taxonomic groups for designing cost-effective monitoring programs. Here I will focus on the theory and practice of using different taxonomic groups and the one-out/all-out concept for assessing ecological change.

Impact of hydropower development in Norway on aquatic invertebrates

Raddum, Gunnar G.

Department of Biology, University of Bergen,
Musèplass 3, N-5007 Bergen, Norway.

E-mail: **Gunnar.raddum@zoo.uib.no**

The paper summarizes results of investigations on the benthic fauna in regulated watersheds in Norway during the period 1965 -2000. Focus will be put on changes in species composition, abundance and biomasses. Effects of high versus low flow will be evaluated with respect to sedimentation of organic material, substrate changes as well as drift pattern of invertebrate larvae. The flow regimes in regulated rivers change often between high and low flow, resulting in rapid changes between wet and dry bottom substrate. A review of responses of this on the bottom fauna will be given. The temperature regimes in regulated rivers have typical changes like increased winter and decreased summer temperatures below power stations. Reduced flow upstream power stations often results in increased summer temperature. Examples of how such changes affect the life cycle, growth and flight period, of insects will be shown. The productivity of natural river systems versus regulated rivers will be discussed with respect to type of watershed, water quality and the geographical situation.

Recovery of benthic communities and ecosystem processes in restored streams

Muotka, Timo

University of Oulu and Finnish Environment Institute , P.O. Box 3000, 90014 University of Oulu, Finland.

E-mail: Timo.Muotka@ymparisto.fi

Channelization is globally one of the major factors causing stream habitat loss and degradation. Streams have been channelized for diverse purposes, but consequences to habitat structure and ecosystem functioning are largely the same: loss of structural complexity, simplified flow patterns, poorly retentive channels, and weakening of the terrestrial–aquatic linkage. In Finland, as also in vast areas of north-west Russia and forested parts of northern USA and Canada, numerous streams have been dredged to facilitate water transport of timber. Recently, extensive restoration programs have been launched to rehabilitate these streams to their pre-channelization state. Restoration is conducted mainly for fishery purposes to provide better habitat for salmonid fish. In a series of studies, we have assessed how such "single-goal" restorations affect other stream biota, using benthic macroinvertebrates as our target organisms. For this purpose, we sampled a set of streams that had been restored in the early 1990s; in 1997, the post-restoration recovery period for these streams ranged from 4 to 8 years. We found that although in-stream habitat structure and invertebrate communities had undergone a gradual change toward unmodified reference streams, the recovery period of up to 8 years still seemed too short for the recovery of benthic communities. It should be noted, however, that due to a low number of replicate streams and high variability among streams, monitoring programs may not easily detect shifts in benthic community composition in restored streams. It might therefore be advisable to use ecosystem-level measures to assess the success of restoration projects. Because of its elemental importance to woodland stream food webs, retention of terrestrially-derived organic matter is an obvious candidate for such an "indicator" process. Based on a Before-After-Control-Impact design, we used leaf retention experiments to show that the retention capacity of a stream clearly increased after restoration, but not as much as could be expected based on the enhanced substrate heterogeneity. This was mainly because the rather heavy machinery used for restoration eradicates aquatic mosses, which are a key retentive feature in many boreal streams. Therefore, if the ultimate goal of restoration is to mimic close-to-pristine stream conditions, relatively large areas of the stream bed should be left untouched to serve as colonization centers for mosses after restoration.

Introduction of new species and the effect of measures such as rotenone treatment on the benthos.

Arnekleiv, Jo Vegar.

Museum of Natural History and Archaeology, Norwegian University of Science and Technology,
N-7491 Trondheim, Norway.

E-mail: Jo.Arnekleiv@vm.ntnu.no

Although in many cases introduced organisms have proved beneficial to man, they have often become a problem in their new habitats as pests or by competing with native species for space and food, and by introducing diseases and parasites. The parasite Gyrodactylus salaris has in later years been introduced to rivers in Norway (1970s), to rivers on the Swedish west coast (1980s), and to a Russian river draining into the White Sea (1980s).
G. salaris was introduced to Norway by imported salmon parr and smolts from Sweden through four known routes. After the introduction, G. salaris spread further within Norway mainly through fish from infected hatcheries. In infected rivers, the density of Atlantic salmon parr has been reduced on an average of 86 %, and the catch of salmon in these rives are reduced by 87 %. In order to eradicate the parasite, Norwegian authorities decided to use rotenone treatments. Such treatments have induced catastrophic drift of benthos and given high mortalities. However, different taxa have different tolerance to rotenone. Investigations of invertebrates in rivers treated with rotenone have shown that a fast recolonization of benthos take place. Some species and groups of animals had high densities a month after the treatment, while other species took one to three years to re-establish in treated river sections. There is a debate on the management of infected rivers and the use of rotenone. In later years focus has been on the development of other methods to prevent further spread and extermination of the parasite. The effects on benthos of using other methods like treatment with Aluminium, are not clear.

CONTRIBUTED LECTURES

Improvement in ecological quality of Danish streams: Macroinvertebrate indicator taxa becoming more abundant and widespread.

Skriver, Jens.

National Environmental Research Institute, Denmark
Vejlsoevej 25, DK-8600 Denmark.

E-mail: jes@dmu.dk

Improvement of water quality as well as in-stream habitat quality has in recent years resulted in a number of improvements in ecological quality of Danish streams. Lowering of BOD5 and total phosphorous concentrations in many streams reflect a general improvement in water quality. Sewage water treatment has been improved gradually in the last 30 years going from mechanical or no treatment to biological or biological/chemical treatment. Improvements in in-stream habitat quality have been caused by more gentle weed cutting methods. Moreover, a large number of restoration projects (remeandering, elimination of obstacles etc.) have been performed to enhance the physical quality and the continuity of Danish streams.
The above mentioned improvements in chemical as well as in-physical stream quality are now also reflected in improvements of the biological quality. This is illustrated by higher values of the Danish Stream Fauna Index. The index is based on the macroinvertebrate fauna and is used as one element under the National Monotoring Programme. In these years many stoneflies, mayflies and caddiesflies becomes more abundant and widespread in Danish stream systems. These changes in the macroinvertebrate fauna are reported by both national and regional authorities and will be illustrated by selected indicator taxa.

Streams in the Midland Forest at Öland; how to value conservation qualities.

Jan Herrmann, Isabell Petersson, Bengt Johan Geijer

Mail: jan.herrmann@hik.se

University of Kalmar, Dept of Biology and Environmental Science, SE-391 82 Sweden

Freshwater habitats are remarkably seldom in focus for conservation concern from environmental authorities, compared with all efforts regarding terrestrial areas. The “aquatic tradition” is weak, organisms in lakes and running waters are less obvious and less known, and the instruments and/or methods are few. The existing and by the Swedish EPA recommended method is “System Aqua”, which emphasises the naturalness (few anthropogenic disturbances) of the watercourse, but to only a lesser extent considers the biological content and variation. Nevertheless, we think that many ecologists at environmental authorities suppose or hope that an area showing high degree of naturalness should also contain a wide variety of species, including several rare ones. System Aqua was used to value ”conservation qualities” in four stream systems in the Midland Forest on the island of Öland, southern Baltic. As coleopterans are by far the most species-rich group in these streams; we constructed a “Col-index”, using species number and several aspects on rarity. Additionally, we performed an estimation of the localities for general recreational usage.
No correlations were seen between the three mark-settings, all made at a five-graded scale. Reasons for this can be that System Aqua values field data about neither the important riparian zone nor the stream’s bottom structures, incl. coarse detritus and woody debris. Thus, System Aqua should perhaps to a higher degree consider species richness, rarities (not only redlisted), and functionality aspects. Complications on this aspect are “intermediate disturbance” and dispersal abilities.

The Impact of Urban Patterns on Ecosystem Dynamics

Christina Avolio [1], Marina Alberti [2], Derek Booth [1], Kristina Hill [3], John Marzluff [4], Rebekkah Coburn [2], Stefan Coe [2], Roarke Donelly [2], Daniele Spirandelli [3]

1) Civil and Environmental Engineering, University of Washington, Seattle, Washington, USA
2) Urban Design and Planning, University of Washington, Seattle, Washington, USA
3) Landscape Architecture, University of Washington, Seattle,
Washington, USA
4) Forest Resources, Division of Ecosystem Science, University of Washington, Seattle, Washington, USA

E-mail: cma@niva.no, raviolia@u.washington.edu

Urbanization is one of the largest-scale, most pervasive, and inevitable processes on Earth. Previous studies on the impacts of urbanization on environmental systems typically correlate changes in environmental systems with simple aggregated measures of urbanization (e.g., human population density, % impervious surface). Yet there is increasing evidence that alternative urban development patterns (e.g. areas with same density but clustered vs. dispersed development) have differential impacts on natural habitats, energy flow and nutrient cycles. We seek to better understand the relationships between different development patterns and their ability to impose different degrees of disturbance to aquatic ecosystems.

We develop an empirical study of the impacts of urban development patterns on in-stream ecological conditions in the Puget Sound lowland region of the northwestern United States. Using benthic macroinvertebrates as indicators of biological integrity, we study how patterns of urban development alter ecological conditions through biophysical changes in forty-two watersheds across a gradient of urbanization. Our working hypothesis is that ecological conditions in urbanizing landscapes are influenced by four urban pattern variables: land use intensity, land cover composition, landscape configuration, and the connectivity of the impervious area. We therefore develop an integrated framework to test both the relationships of urban patterns to benthic macroinvertebrate communities, as well as the scales at which these interactions are controlled. Better understanding of such relationships is critical to predicting impacts of future urban development and to designing mitigation strategies.

Gisli Mar Gislason	The effect of deforestation on benthic invertebrates in rivers in Iceland

Does bug diversity have an effect on our streams?

Malmqvist, Björn.

Department of Ecology and Environmental Science,
Umeå University, Umeå, Sweden.

E-mail: bjorn.malmqvist@eg.umu.se

Humans impact streams in many ways, e.g. by habitat destruction through damming, pollution and introduction of exotic species. These impacts cause loss of species and changed communities. While it is clear that a total loss of invertebrates would be devastating it is less clear whether a change in species richness or composition would have any significant effects. Here, I discuss such diversity effects on stream ecosystems on the basis of experiments performed in our research group. By using shredders/leaf packs as model systems we have demonstrated species-richness effects on litter breakdown, an essential process in forested streams. A change in shredders' processing can also generate indirect effects on other consumers (collectors) that depend on particles generated by shredders. Reduced shredder richness could thus limit the food basis for these collectors. Communities could also respond to disturbances caused by changes in the relative densities of species. Historically, experimental studies have used high evenness of test organisms, despite the fact that natural communities are uneven. Field studies in Sweden and France show that natural streams vary in dominance over both time and space and that this variation seems to affect processing rates. Thus, to understand the consequences of perturbation of natural stream systems we need a better understanding of the effects both on species richness and on species composition

Do littoral macroinvertebrates correspond to “proper” limnological lake types?

Henn Timm & Toomas Kõiv

The VõrtsjärvLimnological Station, Institute of Zoology and Botany, Estonian Agricultural University;
61101 Rannu, Tartumaa, Estonia.

E-mail: htimm@zbi.ee

We used compound handnet samples of macroinvertebrates from the littoral of 80 Estonian lakes (one sample from each lake) to test the concordance between macroinvertebrate composition and main limnological types. Samples distinctly influenced by pollution or water regulation were not included. Five types of small lakes (with area 0.01-10 km2) were studied: highly calcareous (cold spring-fed), 3 lakes; common hardwater, 45 lakes; dark brown softwater (humic), 8 lakes; light softwater, 6 lakes; and former sea lagoons (halotrophic), 16 lakes. Two lakes, Peipsi-Pihkva (3500 km2), and Võrtsjärv (270 km2) belong to large hardwater subtype.
To examine similarities in the littoral fauna among lakes, we used family-level data in detrended correspondence analysis (DCA). An ordination by DCA indicated that macroinvertebrates of softwater humic lakes constituted the most different cluster. Light softwater lakes formed a transition group between the humic and hardwater lakes. No very clear differences occurred among the hardwater lakes, irrespectively to their water colour. However, the majority of hardwater lakes with larger area and/or with harder bottom seemed to concentrate away from the smaller ones that had quagmire edge. Similarly, halotrophic lakes that generally had very variable character were distributed primarily according to bottom substrate type in sampling site. Cold spring-fed lakes were indistinguishable of small hardwater lakes with quagmire edge.
Using centred Principal Component Analysis (cPCA), the lakes were also compared on the basis of three indices of biological quality (total taxa richness as a measure of biodiversity, British Average Score Per Taxon as a measure of general quality, and Swedish Acidity Index as a measure of acidity). Similarly to the previous analysis, softwater lakes (particularly humic) were easily separable from hardwater lakes, but other relationships required more detailed analysis.
We concluded that littoral macroinvertebrates revealed well the most basic differences in lake chemistry. At the same time, the variability induced by other factors (particularly by different bottom types) need further attention.

Species-specificity among lake-dwelling shredders.

Bjelke, Ulf.

Freshwater Ecology Group, Department of Biology and Environmental Sciences, University of Kalmar, SE-391 82 Kalmar, Sweden.

E-mail: **Ulf.bjelke@hik.se**

In ecosystems, specific biological functions are often performed by separate species. In order to simplify studies of flow of energy or matter, functionally similar species are frequently merged into guilds or functional groups. This is a convenient and perhaps necessary generalisation. Yet, in many cases, little is known if the species are sufficiently similar. I will present a study, treating the role of individual species of shredders for processing of plant matter in the littoral of south-Swedish forest lakes. Taxonomically nine species were trichoptera larvae and one an isopod. Several aspects of the dynamics in this functional group of benthic invertebrates were examined; spatial and temporal differentiations, variations in shredding efficiency at normal conditions and at slight hypoxia. Furthermore the short-term effects of adding or subtracting species to the process of decomposition were tested. Species-specificity was found in temporal and spatial distribution, in processing efficiency, and ability to decompose leaf matter at moderate hypoxia. However, no short-term effects of species richness were found. Altogether, the study shows that species in the shredder functional group in lakes in this region cannot be treated as a unit with equal properties in the decomposition process.

Recolonization of invertebrates after rotenone treatment of a West Norwegian river

Gladsøl, John A.[1] **and Gunnar G. Raddum** [2].

1) Office of County Governor in Sogn og Fjordane, N-6863 Leikanger, Norway.
2) Institute of Biology, University of Bergen, Norway.

E-mail:

In 1997 the river Lærdalselva was treated with rotenone with the aim to exterminate the salmon parasite Gyrodactylus salaris. The river was treated twice, once in April and once in August. Following the treatments extensive studies were carried out on different invertebrate species for investigations of the recolonization. Surber samples were taken one week before and one week after the treatment in August. After that, sampling was performed every month during the next ten months. Samples were taken from six sites in the river, two untreated sites, one site treated once and three sites treated twice. One week after the treatment some species were reduced in number, while other species were missing. During the next two months most of the species reappeared. After ten months the compositions of species were more or less similar to the situation before the treatment. Ordinations with RVA (Redundancy Variate Analysis) showed that the rotenone treatment had influenced the species compositions with about four percent after ten months. The most important parameters determing the community were the lifecycles and the situation of the sampling locality. A modification of Jaccard's index, including species abundances, showed no major differences in the similarity between treated and untreated sites one week after the treatment. The species showed great differences in tolerance to rotenone. Species like Diura nanseni, Isoperla sp. and Leuctra fusca were very sensitive to rotenone, while Ephemerella aurevillii, Elmis aenea and Polycentropus flavomaculatus were little affected by the treatment. In conclusion the treatment with rotenone in the river Lærdalselva had a temporary and limited effect on the invertebrates studied.

Short-time effects of rotenone on benthic invertebrates in two Norwegian rivers.

Kjærstad, Gaute and Jo Vegar Arnekleiv

Museum of Natural History and Archaeology,
Norwegian University of Science and Technology,
N-7491 Trondheim, Norway.

E-mail:

During rotenone treatments in order to eradicate the salmon parasite Gyrodactylus salaris, drift samples and aquarium experiments where carried out to assess short-time effects of rotenone on benthic invertebrates in two Norwegian rivers. Both rivers were treated three times including two pre-treatments (April and October 2001), and a main-treatment in August 2002.

All treatments induced an immediate catastrophic drift mainly of dead individuals. The invertebrates' response with respect to their degree and timing of drift/mortality to rotenone exposure varied highly between taxa. Baetis rhodani (Ephemeroptera), Isoperla sp. (Plecoptera), and Rhyacophila nubila (Trichoptera) responded quickly with numbers peaking early in the treatments, indicating high sensitivity to rotenone. Ameletus inopinatus, Heptagenia sp. (Ephemeroptera) and Agapetus sp. (Trichoptera) showed a slower response with numbers peaking later in the treatments, indicating lower sensitivity to rotenone. Ephemerella aurivillii, and E. mucronata (Ephemereoptera) drifted in low numbers throughout the treatments and seemed less affected. Elmis aenea, Limnius volckmari (Coleoptera, Elmidae) and Lymnaea peregra (Mollusca, Lymnaeidae) had no mortality during 10 hours of exposure as indicated by aquarium experiments.

Aquarium experiments supported the results of the drift samples and indicated that even if species had different habitats and behaviour, which may lead to different exposure to rotenone, this was of less importance regarding the mortality of the examined taxa. Earlier instars of insect larvae were generally more sensitive to rotenone than later instars.

Leaf litter breakdown at stream sites with different pH and organic carbon regimes.

Zlatko Petrin[1], Brendan McKie[1], Ishi Buffam[2], Hjalmar Laudon[2], Björn Malmqvist[1]

1) *Department of Ecology and Environmental Science, Umeå University, Umeå, Sweden*
2) *Department of Forest Ecology, Swedish University of Agricultural Sciences, Umeå, Sweden*

E-mail: zlatko.petrin@eg.umu.se

The structure and function of acidified stream ecosystems is often impaired. In contrast, naturally acidic streams may be as functional as circumneutral systems. We investigated litter breakdown and shredder assemblages in seven naturally acidic streams in northern Sweden. The streams follow a gradient ranging from those with high dissolved organic carbon- (DOC) and consistently low pH-levels to those with much lower DOC- and higher base flow pH-levels but with a transient pH decline associated with snow melt. We found that litter breakdown could be explained by microbial activity alone at sites with high but variable pH. Significant decomposition due to shredding was only found in streams with high DOC- and low but stable pH-levels. Correspondingly, shredders dominated macroinvertebrate assemblages at the most acidic sites, while guild composition was more mixed in less acidic streams. Both shredder richness and density were highest at the most acidic sites, but neither these factors nor species dominance proved to be significant predictors of decomposition rates. The results indicate that the pH and DOC dynamics need to be considered when studying assemblage structure and ecosystem process rates in naturally acidic lotic freshwater environments.

Standardisation of river classifications (STAR) – an EU-project supporting the WFD: the Nordic perspective

Skriver, Jens [1], **Annette Baattrup-Pedersen** [1], **Nikolai Friberg** [1], **Richard Johnson** [2], **Morten L. Pedersen** [1] **and Leonard Sandin** [2].

1) NERI,Department of Freshwater Ecology, Vejsøvej 25, DK-8600 Silkeborg, Denmark.
2) Department of Environmental Assessment, SLU, P.O. Box 7050, SE-750 07 Uppsala, Sweden.

E-mail: jes@DMU.dk

The EU water Framework Directive (WFD) (Directive 2000/60/EC – establishing a Framework for Community Action in the Field of Water Policy), defines a framework for assessing all kinds of waterbodies. A focus of the assessment systems demanded for by the WFD is the use of biotic indicators (macrobenthic fauna, fish fauna and aquatic flora). The ecological status has to be defined based on a near-natural reference condition. Therefore, most European countries have to change or extend their assessment systems in near future. An integrated part of this process is to make inter-country comparisons possible and hence to standardise or intercalibrate national methods. The STAR (Standardisation of river classifications : Framework method for calibrating different biological survey results against ecological qualti classifications) project aims to solve these problems by addressing a series of key issues, including e.g. which method or organism group is capable of indicating a certain stressor and which method can be used on which scale. The Danish STAR data set has shown no strong inter-correlations among the various biological quality elements, suggesting that additional information on stream status is obtained by using more than one indicator. However, within the quality elements, several metrics were strongly inter-correlated and number used could probably be reduced. In addtion, a compariosn between the Danish macrophyte methods and the UK MTR method employed at all STAR sites showed an overall good agreement with repects to species richness and total coverage.

An assessment of chironomids as a tool for inferring Holocene climate

Velle, Gaute

Department of Biology, University of Bergen, Musèplass 3, N-5007 Bergen, Norway.

E-mail: Gaute.Velle@zoo.uib.no

Calibration data sets based on chironomids (Chironomidae: Diptera:Insecta) are increasingly being used to quantify past climates. In these calibration sets, we wish to model the relationship between the present distribution and abundance of chironomids to contemporary climate. This information on the modern fauna is then employed to quantify past climates from a fossil chironomid assemblage. Down-core studies in North America and Europe shows that chironomids strongly responded to the broad-scale climatic fluctuations during the late-glacial. For the Holocene, chironomid-based temperature reconstructions have also produced encouraging results. However, the reliability of our inference models to reconstruct Holocene climates may be raised because the inherent sample-specific prediction errors of the inference models (ca. ±1°C) are the same order of magnitude as the expected Holocene temperature changes (i.e. ±1-2°C). In the present study, I attempt to validate the use of chironomids as indicators of Holocene temperature by assessing the reproducibility of results and to examine the environmental factors that may have influenced the fossil assemblages. Chironomid stratigraphies and inferred temperature from six Holocene low-alpine cores from southern Scandinavia are compared. In general, there are many time segments with a poor among-lake fit in inferred temperatures. Either microclimate has overridden the regional climate signal, or the chironomids have responded more strongly to local environmental or biological variables than to air temperature. Possible environmental variables influencing the fossil chironomid assemblages are interpreted in light of the taxon-environment relationships in a modern Norwegian calibration data set. These analyses indicate that local changes in pH, water chemistry, and productivity at times may have overridden the regional temperature signal. Holocene temperature inferences from single cores based on chironomids may not be adequate to provide a reliable regional temperature signal, but can act as a guide from which hypotheses about past environmental conditions can be tested with the aid of chironomid-inferred temperatures from several sites and from other environmental proxies.

Placing a hundred thousand species including 1202 chironomids on the internet.

Sæther, Ole A.

Museum of Zoology, The Natural History Collections, Bergen Museum, University of Bergen, Muséplass 3,
N-5007 Bergen, Norway.

E-mail: **ole.sather@zmb.uib.no**

The Fauna Europaea project is funded by the European Commission for a period of four years (1 March 2000 - 1 March 2004). Fauna Europaea will assemble a database of the scientific names and distribution of all living multicellular European land and fresh-water animals. Experts in taxonomy will provide data of all species currently known in Europe. Together these data will form a huge database which will be accessible to everyone. The University of Amsterdam coordinates the project, assisted by the University of Copenhagen and the National Museum of Natural History in Paris.
Once the Fauna Europaea database is finished it will provide a unique reference for many groups such as scientists, governments, industries, conservation communities and educational programs.
The chironomids are covered by me and Martin Spies. The excel data file is completed and cover 1202 species from the European mainland, Svalbard, plus the Macaronesian islands (exl. Cape Verder Is.), Cyprus, Franz Josef Land and Novaya Zemlya.
The chironomid list includes 1202 species. Of these are 12 shared with the Australian region, 20 with the Neotropical, 25 with the Afrotropical, 66 with South Asia, 290 with North Africa, 340 with the North America, 343 with West Asia, and 449 with East Palaearctic. Most species are widely distributed, but 147 are so far recorded only from Fennoscandia, Iceland or Northern Russia, but about a third of these have only been found once or twice.
The project has led to several other papers including new descriptions, redescriptions, new synonyms and new combinations. Some of the new synonyms, combinations and species are shown.
The Fauna Europaea project has shown that there is wide acceptance for the web as a taxonomic medium.
The file is demonstrated.

POSTER PRESENTATIONS

No 1

Seven years of invertebrate colonisation in a manmade wetland system.

Petersson Isabell and Jan Herrmann

Freshwater Ecology Group, Dept of Biology and Environmental Science, University of Kalmar,
SE-391 82 Kalmar, Sweden.

E-mail: isabell.petersson@hik.se

The manmade wetland dam system "Kalmar Dämme" was primarily constructed (1996) for reduction of nitrogen, but also for promoting more aquatic habitats in the landscape, thus favouring recreation and biodiversity. Five representative localities were sampled intensively (often and six samples at each locality) the first 1.5 years, this short-term colonisation has been earlier reported. In parallel, and since then twice each year, were also taken a 5 min samples (Surber or handnet) to integrate the range of microhabitats in each locality. This allowed us to follow the long-term colonisation of macroinvertebrates throughout the years.
Questions asked: How is the invertebrate community composed and how does it vary over time and between the localities? Does the functional feeding group composition differ and why so?
Most invertebrates that dominated the first two years seem to remain relatively stable. The most common species/taxa in the later years were Asellus aquaticus, Cloeon dipterum, Zygoptera and Chironomidae.

No 2

Decomposition of macrophyte litter under different experimental conditions.

Bohman, Irene M.

*University of Kalmar, Freshwater Ecology Group,
Dept of Biology and Environmental Science,
S-391 82 Kalmar.*

E-mail: **Irene.Bohman@hik.se**

Both allochthonous and autochthonous dead organic matter are accumulated and processed in lake littoral zones and the products can be important for the whole ecosystem metabolism. Availability of various products from the litter processing, e.g. carbon dioxide, dissolved organic matter, fine particular detritus, bacterial, fungal and invertebrate biomass, follow a seasonal pattern in freshwater habitats in temperate zones. Passive leaking of dissolved organic matter, DOM, from submerged leaf litter is often about 20-30% of initial dry weight and set free under the first 2-3 weeks. Benthic invertebrates, shredders, have been shown to speed up the processing of coarse particular detritus, CPOM. To illustrate the leaking of DOM and the role of shredders for processing CPOM from marcophyte litter, parallel field and laboratory experiments were conducted. I used one soft, Nymphaea alba, and one recalcitrant litter type, Phragmites australis. For both litter types and under both experimental conditions shredders influenced decomposition rate positive, while passive leakage was much less from reed than from water-lily litter. My conclusion is that winter active shredders are potential key species also for macrophyte litter transformation in lakes.

No 3

Trophic fractionation in Chironomus riparius reared on food of aquatic and terrestrial origin.

Goedkoop1, Willem 1**, Nina Åkerblom1** 1 **and Marnie H. Demandt**2.

1) Department of Environmental Assessment, Swedish University of Agricultural Sciences, Box 7050, SE-750 07 Uppsala, Sweden.
2) Department of Ecology and Evolution, Uppsala University, Norbyvägen 18 D, SE-752 36 Uppsala, Sweden.

E-mail: willem.goedkoop@ma.slu.se

Trophic fractionation was studied in short-term feeding experiments with larvae of the deposit-feeding midge Chironomus riparius Meigen. Larvae were fed food of terrestrial (oat) and aquatic origin (artificial sediment, Spirulina, Tetraphyll®). By analyzing both whole larvae and gut tracts we could distinguish between the isotopic signature of recently ingested gut material and that of assimilated carbon and nitrogen in body tissue. Additionally we studied the effects of microbial conditioning, i.e. the colonization and growth on food particles by microbes, on the isotopic signal of food resources. Nitrogen fractionation for these food resources was 0.67–2.68‰ across the food-invertebrate interface, i.e. considerably lower than the frequently assumed enrichment of 3.4‰. Microbial degradation of food particles resulted in an approximate doubling of the delta15N in 8 days, from 6.24±0.05 to 11.36±0.56‰. Values for delta13C increased only marginally over the 8-day interval, from –20.66±0.11 to –20.34±0.12‰. These results show that microbial processes are important determinants for the isotopic composition of detritivorous invertebrates and thus contribute to the large variation in trophic fractionation in the literature.

No 4

Temporal and spatial changes in the macrozoobenthos communities of littoral zone in Lake Peipsi.

Kumari, Margit & Kangur, Külli

Institute of Zoology and Botany at the Estonian Agricultural University, Võrtsjärv Limnological Station, 61101Rannu, Estonia,

E-mail: kkangur@zbi.ee

Lake Peipsi (3 555 km2), located on the border of Estonia and Russia, is the fourth largest lake in Europe. It is a shallow (mean depth 7.1 m) unstratified water body. The lake consist of three parts: the northern L. Peipsi s.s., the narrow L. Lämmijärv and the southern L. Pihkva. L. Peipsi s.s. is a eutrophic lake and L. Pihkva is strongly eutrophic. In L. Peipsi is high abundance and biomass of macrozoobenthos (mean ±S.E. without big molluscs 2577±133 ind. m-2, 12.61±0.70 g m-2 in 1964-2001). The aims of this study were to find out the main factors affecting the structure of the macrozoobenthos communities in the littoral zone of the lake, to establish long-term changes in the abundance and biomass of different groups of bottom animals, to clarify changes in the structure of these communities and in the share of different groups of bottom animals. The material for this study was collected from 17 profiles at different depths (0, 1, 2, 3 and 4 m) in the littoral zone of L. Peipsi in July – August 2000. The data of a similar study, conducted in 1970, 1980 and 1990 (Timm et al., 2001), were used for comparison. Quantitative samples were taken with two different Ekman type bottom grabs: the Borutskij sampler for soft sediments, and the Zabolotskij sampler for sandy or stony substrates, both with a grasp area of 225 cm2. The animals were sorted alive by the eye and were fixed in 70 % ethanol in four separate vials (for Chironomidae, Oligochaeta, small Mollusca and other small animals). Large molluscs (mainly Dreissena) were fixed separately and were not included in the total figures of macrozoobenthos abundance and biomass due to their much bigger individual weight compared with all other animals. In the statistical processing of the data, dispersion analysis was employed which took account of the effects of the vegetation, substrate, depth, year and sampling site. In July-August 2000, the mean macrozoobenthos abundance (without big molluscs) was 5 068 ind. m-2 and biomass 15.4 g m-2 (wet weight). The mean abundance of big molluscs was 702 ind m-2 and biomass 315 g m-2. Chironomidae were dominant in the littoral zone. Abundance of chironomids and big molluscs was the highest at 4 m depth while that of oligochaetes, small molluscs and "other groups" at 0-2 m depth. The vegetation influenced the abundance and biomass of oligochaetes, small molluscs and “other groups”. The substrate has an impact on the abundance and biomass of big molluscs and "other groups". Depth of water affected the abundance and biomass of all animal groups. The abundance and biomass of most bottom animal groups of the littoral revealed changes in different years. The abundance and biomass of chironomids revealed the greatest yearly changes. The amount of Dreissena polymorpha was the highest in 1980, which can be associated with the strong eutrophication of the lake in this period. Changes in the structure of the communities of the littoral in different years are reflected in alterations in the proportions of the animal groups. The proportions of chironomids and oligochaetes have changed most significantly.

Reference: Timm, T., Kangur, K., Timm, H. & Timm, V. 2001. Zoobenthos. Lake Peipsi. Flora and Fauna (Pihu, E. & Haberman, J., eds.). Sulemees Publishers, Tartu: 82-99.

No 5

Distribution and filtration rate of the zebra mussel Dreissena polymorpha (Pallas) in Lake Peipsi.

Mälton, Evely & Kangur, Külli

Institute of Zoology and Botany at the Estonian Agricultural University, Võrtsjärv Limnological Station, 61101 Rannu, Estonia.

E-mail: kkangur@zbi.ee

Lake Peipsi, the biggest transboundary lake in Europe, is located on the border of Estonia and Russia. The total area of the lake is 3555 km2, mean depth is 7.1 m, and maximum depth is 15.3 m. The lake consists of three unequal parts: the largest and deepest northern L. Peipsi s.s., the southern L. Pihkva, and the narrow strait-like L. Lämmijärv connecting them. The lake is well mixed by the waves and currents. The ice cover lasts usually from December to April. Lake water is the warmest (usually 21-22oC in open water) in July-August. The profundal comprises approximately 50% and the sublittoral approximately 45% of the whole benthal. Sand and aleurite prevail in the shallow coastal regions, while the deep central parts are mostly covered with mud. The zebra mussel invaded L. Peipsi in the 1930s (Mikelsaar, Vinkel, 1936) forms now the most significant animal population of the lake in terms of biomass. The biomass of zebra mussel exceeds the biomass of all other bottom animals about 20 times. Based on the annual monitoring of 1964-2003, their average (with ±SE) abundance and biomass in the lake were 325 ± 44 ind. m2 and 241 ± 29 g m2, respectively. The aim of this study was to estimate the distribution of this mussel in different substrates and depths, to determine the length–frequency distribution of population in L. Peipsi, also to evaluate filtration rate of mussels and their effect on plankton communities. Study material was collected in the coastal zone and in the open water area of the lake in June 2002. In the open water area, quantitative samples were taken with two different Ekman type bottom grabs: the Borutskij sampler for soft sediments, and the Zabolotskij sampler for sandy or stony substrates, both with a grasp area of 225 cm2. In the littoral zone zebra mussels were collected using SCUBA with Tvärminne sampler (grasp area of 314 cm2) at different depths 1 – 10 m. The field experiments for evaluating the filtration rate of zebra mussels were carried out in August (water temperature was 19.5 - 25°C). Filtration rate is defined as the amount of water cleared of particles per mussel per unit time. The distribution of the zebra mussel in L. Peipsi is uneven and depended strongly on the substrates and depths. In L. Peipsi s.s., zebra mussel was found at the depths of 1.5 - 8 m. Dreissena were absent on soft muddy substrates of the profundal. The sublittoral was the preferred zone for Dreissena. The mussel was the most abundant on hard substrate at depth 4 - 6 m. At depth of water less than 1.5 m (independently of substrates) Dreissena were absent, probably, due the action of waves and ice. The length group of zebra mussel of 14 - 16 mm was dominated in samples from L. Peipsi s.s., while the measured minimum length was 0,4 mm and the maximum length 26 mm. According to the field experiments, the average filtration rate of one individual with average length of 22 mm was estimated 30 ml ind.-1 h-1 (ranged 16 – 51 ml ind.-1 h-1 based on decline of chlorophyll a content in the experiment containers). Experiments demonstrated that D. polymorpha is not able to feed on Gloeotrichia echinulata because the colonies of this cyanobacteria are too big. Thus, zebra mussel could not influence strong G. echinulata blooms that occurred in the lake in summer 2002 and 2003.

Reference: Mikelsaar, N.-Õ., Vinkel, R., 1936. Uusi andmeid rändkarbi Dreissena polymorpha Pall esinemisest. Eestis. Eesti Loodus: 142-145.

No 6

Making Wild Rivers Wilder. Ecological Recovery of the Vindel and Pite Rivers (EVP), Sweden.

Hjerdt [1]**, N., J. Helfield1, E. Törnlund1, R. Jansson** [1]**, C. Nilsson** [1]**, F. Lepori** [2]**, B. Malmqvist** [2]**, D. Palm** [3]**, J. Östergren** [3]**, H. Lundqvist** [3]**, E. Brännäs** [3]**.**

1) Department of Ecology and Environmental Science, Landscape Ecology Group, Umeå University, SE-901 87 Umeå, Sweden.
2) Department of Ecology and Environmental Science, Stream Ecology Group, Umeå University, SE-901 87 Umeå, Sweden.
3) Department of Aquaculture, Swedish University of Agricultural Sciences, SE-901 83 Umeå, Sweden.

E-mail:

Timber floating in the 19th to mid 20th centuries caused the extensive channelization of watercourses in boreal Scandinavia. Following the end of timber floating, concerns over the potential consequences of channelization for riverine biota led to several restoration attempts, but the ecological consequences of this restoration work remain poorly understood. A multidisciplinary research team was therefore established to assess the consequences of the restoration of watercourses within the Vindel and Pite catchments, northern Sweden. We predicted that the restoration would increase geomorphic and hydraulic complexity in stream and river channels, thus increasing retention capacity of water, sediment, organic matter and nutrients. In turn, such changes might benefit the abundance, diversity and production of aquatic organisms either directly through the improved habitat quality, or indirectly through the enhancement of energetic pathways. Field surveillance is currently undertaken to test these predictions.

No 7

Impact of river regulation on blackfly populations and surrounding terrestrial ecosystems.

Strasevicius, Darius and Björn Malmqvist

*Department of Ecology and Environmental Science,
Umeå University, Sweden.*

E-mail: **darius.strasevicius@eg.umu.se**

The regulation of rivers for the purpose of production of electric energy has a negative impact on blackfly populations. Our studies along seven of the biggest North Swedish rivers suggest that the abundances of adult blackflies had been reduced several fold along regulated versus naturally flowing rivers. However, not much is known how the river regulation and, in turn the amounts of blackflies, might influence terrestrial and water bird populations. On the one hand, positive effects of blackflies can represent an important food resource to insectivorous bird species. On the other hand, negative effects can be expected because of their blood-sucking involving both disturbances (harassment and anemia) and the transmission of avian blood parasites (*Leucocytozoon sp*). Our investigations suggest that the densities of different avian species were affected differentially. More detailed analyses of the breeding of Pied Flycatcher (*Ficedula hypoleuca*) demonstrated higher breeding success along naturally flowing rivers, presumably due to greater food availability.

No 8

Biological quality in Estonian running waters: Rapid bioassessment of reference streams using macroinvertebrates.

Mardi1, Kristiina, Nikolai Friberg 2 **and Henn Timm** 1 **.**

1) *Võrtsjärv Limnological Station, Institute of Zoology and Botany, Estonian Agricultural University, 61101 Rannu, Tartumaa, Estonia.*
2) *National Environmental Reseach Institute, Silkeborg, Denmark.*

E-mail: kristiinamardi@hotmail.com

Macroinvertebrates were collected in 15 undisturbed Estonian streams to describe reference conditions and evaluate a suite of bioassessment tools. A large number of physical and chemical variables were also collected at different spatial scales; e.g. geographical and catchment characteristics, substrate, in- and near stream vegetation. In total, 55 macroinvertebrate samples were collected, using standardized kick sampling method (EN 27 828) at each site in spring and in summer 2001, in order to generate a preliminary database of reference samples for estimation of biological quality. Substrate composition was the variable that explained differences in macroinvertenbrate composition best i.e. the majority of metrics used indicated better quality at sites characterised by coarse, stony substratum. In contrast, stream size and season were only weakly related to macroinvertebrate compostion. Some metrics as ASPT were little or not influenced by the factors studied. At the same time, the DSFI and EPT were significantly related to several factors, among them the compound index of river, channel and environmental parameters (RCE). This could indicate that some of streams have been physically modified and therefore not true references. In many cases the Swedish criteria for indicator metrics is suitable for use in biological quality assessment in Estonian waters, except the EPT index, which is naturally lower in Estonia. The preliminary database created here added much valuable information for biological quality estimation, according to macroinvertebrate community, which can be used when implementing the Water Framework Directive.

No 9

Changes in benthic invertebrate assemblages and incidence of larval deformities in response to industrial pollution in River Kymijoki, Finland.

Kiiski1, Anna., Heikki Hämäläinen 2**, Simo Salo** 3**, Matti Verta** 3, **ja Jussi V.K. Kukkonen** 4 .

1) University of Joensuu, Laboratory of Aquatic Ecology and Toxicology, c/o Southeast Finland Regional Environment Center, P.O. Box 1023, FIN-45101 Kouvola, Finland.
2) University of Jyväskylä, Department of Biological and Environmental Science, P.O. Box 35, FIN-40014 University of Jyväskylä, Finland.
3) Finnish Environmental Institute, Research Department, P.O. Box 140, FIN-00251 Helsinki, Finland.
4) University of Joensuu, Department of Biology, P.O. Box 111, FIN-80101 Joensuu, Finland.

E-mail: **Anna.Kiiski@ymparisto.fi**

Changes in benthic invertebrate assemblagesand incidence of mentum deformities in midge (Diptera, Chironomidae: Chironomus spp.) larvae in response to industrial pollution were studied in River Kymijoki, Southern Finland. Sediments of the river are highly contaminated by polychlorinated dioxins, furans and other organic compounds as well as mercury. Benthic invertebrates were collected from 20 sites with depositional sediments differing in contamination. From each site, 30 samples were taken with a Kajak -corer. For deformity analysis, larvae of Chironomus spp. were collected by a pump sampler from the same sites. Chemical analysis included e.g. concentrations of PCDD/Fs, PCDEs and mercury. The incidence of deformities increased up to 54 % below the main contamination source, decreased with increasing distance downstream and showed a significant correlation with the mercury and PCDD/F concentrations of the sediments. Associations of invertebrate community structure with the sediment contamination and mentum deformities are examined.

POST CONFERENCE TOURS

1. **Lærdal to Bergen**
   Co ordinator: Gunnar Raddum (gunnar.raddum@zoo.uib.no).
   An excursion tour on 12 May will start in Lærdal and end up in Bergen. On the way we will stop at the regulated river Aurland where we will visit one of the power stations and be informed about the regulation, problems for fisheries after regulation and efforts for minimizing biological damages. The tour will then continue to the Vosso watershed. We will have a lunch break in the small city Voss and be informed about research activities in this watershed before the tour continues along the river. Special smolt traps will be demonstrated and old traps for catching adult salmon. Along with the scientific information we will also be guided through a series of natural and cultural specialties for this part of Norway.

2. **Lærdal to Oslo**
   Co ordinator: John Brittain (jbr@nve.no).
   This tour gives a cross-section of Norway from the dramatic fjord landscape of the west coast to the more gentle wide valleys of the eastern parts of the country. Many of the mountain lakes will still be ice-covered at this time and river discharges will be high, so sampling may be difficult apart from in some of the lowland locations.

   We start after breakfast on Wednesday 12th and travel initially westwards, taking the ferry over the fjords to Kaupanger and Sogndal. From Sogndal we head northwards along the State Road 55. In this region there are several major hydropower developments and we will try and arrange a stop at one of the major power plants in Gaupne. From Gaupne we travel over the mountain pass, Sognefjellet (1440 m a.s.l.), with extensive views of mountain and glaciers, to the village of Lom. Here we will have a short stop before proceeding eastwards along Vågåvatn. After a short while we start ascending again along the State Road 51 towards Bessheim where we plan to spend the night. Bessheim is a traditional small mountain hotel where we will be able to rent cabins.

   The following morning we will visit the famous mountain lake Gjende, which will still be ice-covered. This deep fjord-like lake, located at 984 m a.s.l. lies within the Jotunheimen National Park and was studied during the Norwegian International Biological Programme and Project Aqua back in the 1960s and 70s. We will also have chance to get a view of the Norwegian reference lake, Øvre Heimdalsvatn, which has been the subject of extensive studies since the 1950s and where the University of Oslo has a field station. However, at this time the station is only accessible on skis or by skido, so we will not be able visit the station. However, we will should be able to sample spring emerging Plecoptera along some of the streams and lakes in this area. We then travel on over another mountain pass, the Valdresflya, and down past several lakes to the small town of Fagernes. From Fagernes we then drive down to Oslo. On the way to Oslo we will pass several regulated rivers and you will be able to see remedial measures such as weirs to compensate for the low flows. We plan to arrive in Oslo about 4 p.m.

The total distance from Lærdal to Oslo by this route is approximately 520 km. To save costs this trip is based on using private cars. There are probably several people that will be driving to Lærdal, so we should be able get enough transport if there are sufficient people interested in the excursion. We also plan to spend the night in cabins and self-cater to reduce costs.

We need to know how as soon as possible many people are interested in making this trip back to Oslo We also need to know whether you have a car and how many seats you have.